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United States Patent [19]**Garbuzov et al.**[11] **Patent Number:** **5,818,860**[45] **Date of Patent:** **Oct. 6, 1998**[54] **HIGH POWER SEMICONDUCTOR LASER DIODE**[75] **Inventors:** **Dmitri Zalmanovitch Garbuzov,**
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Clarksburg, all of N.J.[73] **Assignee:** **David Sarnoff Research Center, Inc.,**
Princeton, N.J.[21] **Appl. No.:** **757,883**[22] **Filed:** **Nov. 27, 1996**[51] **Int. Cl.⁶** **H01S 3/19**[52] **U.S. Cl.** **372/45**[58] **Field of Search** **372/45**[56] **References Cited****U.S. PATENT DOCUMENTS**

5,661,742 8/1997 Huang et al. 372/45

Primary Examiner—James W. Davie*Attorney, Agent, or Firm*—William J. Burke[57] **ABSTRACT**

A semiconductor laser diode having increased efficiency and therefore increased power output. The laser diode includes a body of a semiconductor material having therein a waveguide region which is not intentionally doped so as to have a doping level of no greater than about $5 \times 10^{16}/\text{cm}^3$. Within the waveguide region is means, such as at least one quantum well region, for generating an optical mode of photons. Clad regions of opposite conductivity type are on opposite sides of the waveguide region. The thickness of the waveguide region, a thickness of at least 500 nanometers, and the composition of the waveguide and the clad regions are such so as to provide confinement of the optical mode in the waveguide region to the extent that the optical mode generating does not overlap into the clad regions from the waveguide region more than about 5%.

19 Claims, 1 Drawing Sheet